ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1909.

XXIII.—MAKRUSS OR ZIMBITI.

(*Androstachys Johnsonii*, Prain.)

In an article on Inhambane Copal (*Kew Bulletin*, 1888, p. 281) reference was made to the communication of specimens by Lt. H. E. O'Neill, H.M.'s Consul for Mozambique, which led to the identification of *Copaifera Gorskiana*, Benth., as the botanical source of this product. Along with the samples of the leaves and bark of this species, sent under Consul O'Neill's despatch, dated 14 February, 1883, were communicated specimens of a second species, referred to in the following terms :—"(2) a few twigs with leaf and seed of the tree called in Mozambique 'Makruss,' the timber of which is impervious to the ravages of the white ant and has a considerable local value." Mr. O'Neill's despatch further states :—"I believe it is the timber produced by this tree that Mr. Lasdell, Timber Inspector of H.M.'s Navy, reported [upon] so favourably in 1859," and hazards the belief that the wood might prove to be of considerable local value, stating also that the tree abounds in the Mosembe district, north of Mozambique.

The specimens, which were examined by Professor Oliver, showed that "Makruss" belongs to the natural family *Euphorbiaceae*, evidently to an undescribed genus which could not be fully characterised in the absence of male flowers. The following report was made to H.M.'s Secretary of State for Foreign Affairs on 9 April, 1883 :—"With regard to the 'Makruss' tree, Professor Oliver is of opinion that it is entirely new to science. Like African oak it belongs to the family *Euphorbiaceae*, but it is quite distinct from that. It would be quite worth while for Consul O'Neill to prepare a special report upon this tree and its timber. The tree produces two kinds of flowers, and Consul O'Neill's specimens were only of one kind. It would be desirable for its more complete study that he should transmit to England further and more complete specimens prepared according to the directions given in the circular which I had the honour to enclose in my last letter relating to the Copal."

Further reference was made to this timber in subsequent correspondence between Kew and Consul O'Neill, but no additional material reached Kew till 22 September, 1908, when specimens

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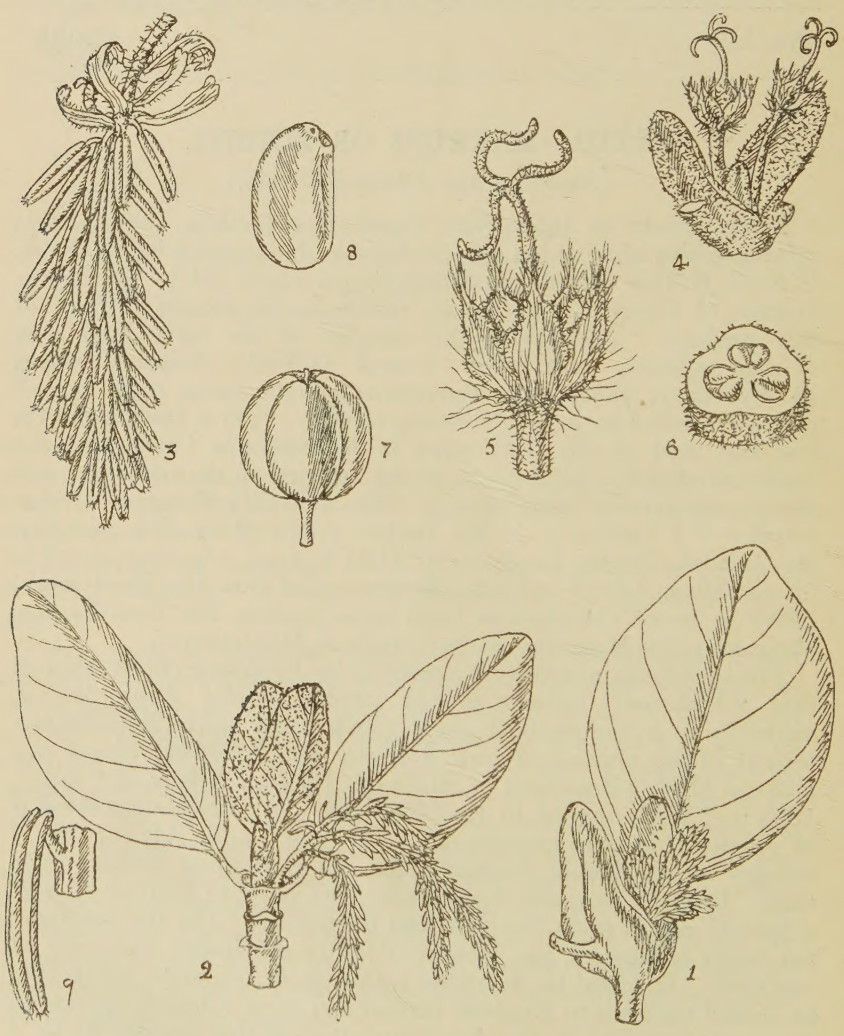
in fruit and specimens with male flowers were received from Mr. W. H. Johnson of the Companhia de Moçambique. The note accompanying these specimens states that the species is a "large hard-wooded tree, common near streams in low country." The specimens actually sent were collected near Beira where the name applied to the tree is not 'Makruss' but 'Zimbiti.' The specimens sent by Mr. Johnson have enabled an examination to be made of the male flowers, which are of a somewhat unusual nature. The necessary technical descriptions of the new genus and species have already been published in this work (*K. B.* 1908, pp. 438, 439).

The general facies of the material is suggestive of the *Buxaceae* as perhaps its natural position, and there was nothing in Consul



1, 2, male flowers ; 3, one male flower, *enlarged ;* 4, female flowers ; 5, one female flower, *enlarged ;* 6, section of ovary, *much enlarged ;* 7, fruit ; 8, seed, *enlarged ;* 9, single stamen from lower part of axis, showing recurved filament, *much enlarged.*

O'Neill's material to contradict this legitimate surmise. The ripe seeds sent by Mr. Johnson show, however, that the raphe is ventral and not dorsal, and indicate that in spite of its somewhat unusual appearance the species should better be referred to the *Phyllantheae*. In the female flowers there is no unusual feature to record ; the perianth is 5-partite with ovate, acuminate, imbricate lobes, while the ovary is 3-celled with two ovules in each cell, and the styles are connate in an elongated column with three reflexed stigmas. The male flowers are, however, sufficiently striking and remarkable. These are ternate in each axil with their peduncles now almost completely fused, now free nearly to the base, the lateral flowers being slightly smaller than the central. Towards the apex of the peduncles are found in the central flower usually 5, in the lateral flowers generally only 2–3 spirally arranged, bract-like perianth-segments quite free from each other. The central axis of the flower is prolonged as a slender catkin-like spike along which the elongated anthers are spirally disposed ; the lowest anthers have very short, but distinct, abruptly recurved filaments, the others being sessile ; they are distinctly 2-celled, the cells being adnate to the connective and dehiscing throughout their length.

In connection with the study of the species Mr. L. A. Boodle very kindly undertook a careful examination of the anatomy of this somewhat singular plant and has supplied the following note :— "The anatomical structure of the stem and leaf of *Androstachys Johnsonii* was examined in order to see what indications it would give with regard to systematic position. Among the anatomical characters of this species are the following :—sclerenchymatous fibres are present in the mesophyll of the leaf ; in the stem there is a special hypoderm of about three layers of cells having thick walls which finally become lignified ; the periderm arises just below the hypoderm, *i.e.*, in about the fourth layer below the epidermis ; there is a continuous ring composed of fibres and sclerotic cells in the pericycle."

All these are characters that do not favour affinity with the *Buxaceae*, while all of them are characters that are quite satisfactory for an Euphorbiaceous species. A microscopic examination of the stamen and seed respectively showed that there is no articulation of the filament and that the raphe is certainly ventral.

Mr. W. H. Johnson has further very kindly supplied the following note with regard to the "Zimbiti Timber Tree."

"Although abundant in the low country of the Manica and Sofala Territories the Zimbiti tree only appears to flourish on the banks of streams or adjacent thereto, and in such situations 90 per cent. of the arborescent vegetation is composed of it. Many of these trees have their trunks submerged to a height of 4 or 5 feet when the streams are swollen by the rains. The trunk of mature trees is frequently 6 feet in circumference and unbranched up to a height of 40 feet. The bark is flaky and silvery grey in colour ; this, together with the white downy coating on the under surface of the leaves and young leaf-buds and the characteristically poplar-like habit of the tree, render it a most conspicuous object, even at comparatively long distances.

"The colour of the sap-wood is white and that of the heart-wood a dull brown. The latter is rich in resin, and when burned gives off a fragrant odour resembling frankincense.

"The sap-wood, which in mature trees is a negligible quantity, is subject to attacks both by white ants and boring beetles, but the heart wood is impervious to all such insects. Owing to its great strength and durability this timber is invaluable for bridge and house piles and is generally employed locally for both these purposes. Although hard and heavy it can be readily sawn into planks which are admirably adapted for verandah floors, steps, and similar constructions which are constantly exposed to climatic influences."

XXIV.—FUNGI EXOTICI: IX.

G. Massee.

Until quite recently, in dealing with the general distribution of fungi, it was considered that the fleshy, perishable forms included in such genera as *Boletus*, *Agaricus*, *Hydnum*, &c., were characteristic of, and mostly confined to, the north temperate zone, whereas dry, cartilaginous, or corky forms, represented by species of *Polystictus*, *Hexagona*, *Stereum*, &c., were equally characteristic of tropical regions. We now know that this generalisation is incorrect, and was simply founded on the fact that the dry coriaceous species of fungi, requiring no attention in the way of drying, were collected by most botanists in the tropics; whereas the fleshy species, difficult to preserve under the most favourable of conditions, were systematically ignored.

The species of *Boletus*, being exceptionally fleshy and prone to decay, are practically unknown from tropical countries. The first African species, *B. curtipes*, Massee, was described in this Journal only last year. The present batch of species were all collected in the Botanic Gardens, Singapore, very beautifully coloured figures of each being made by Mr. C. G. de Alwis, and the specimens were preserved in spirit.

Twenty-two figures of species of *Boletus* were made from specimens collected in the gardens, and all these, judging from the figures, are well-marked, undescribed species. The condition of the spirit material in a few cases, however, did not enable a full diagnosis to be drawn up, but the fact of twenty species of *Boletus* occurring in such a limited area as that indicated proves that the most fleshy of fungi are well represented in tropical regions.

Polyporaceae.

Boletus rufo-aureus, *Massee.*

Pileus globoso-pulvinatus, quandoque subumbonatus, carnosus, glaber, rufo-aureus, centrum versus fuscescens, margine involutus, levis, undulatus vel lobatus, 5 cm. latus. *Tubuli* stipiti adnati, brevissimi, flavescentes; pori minutissimi, rotundati, aureo-rufescentes. *Stipes* sursum incrassatus, solidus, pileo concolor, subsquamulosus vel maculis saturatioribus variegatus, basi pallidus, 7 cm.

longus, 2 cm. crassus. *Sporae* cylindrico-fusiformae, flavo-rubiginosae, 10 × 4·5 μ. *Caro* compacta, albida, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 61, ser. 2.

A brilliantly coloured fungus, remarkable for the very short tubes (1–2 mm.) and the very minute, rounded pores. The pileus in some specimens has a suggestion of an umbo. Not closely allied to any published species, but showing affinity in some respects with *Boletus spadiceus*, Schaeffer.

Boletus altissimus, *Massee*.

Pileus conico-convexus, dein pulvinatus, glaber, aetate alveolatus, rufo-brunneus margine albido, 7–8 cm. latus. *Tubuli* subliberi, elongati, flavo-virentes; pori magni, polygoni vel flexuoso-oblongi, griseo-virides. *Stipes* solidus, aequalis, basi incurvatus, glaber, albo-brunneus, 24–28 cm. longus, 1 cm. crassus; annulus cortiniformis, superus. *Sporae* fusiformae, fuliginosae, 7–8 × 4 μ. *Caro* compacta, albida, 1 cm. crassa, versus marginem tenuissima.

SINGAPORE. On the ground, *Ridley*, 9, ser. 2.

A peculiar fungus, remarkable for the very long, equal, slender stem, bearing near the apex a cortinate ring or annulus. Not closely allied to any known species, but may be placed in the vicinity of *Boletus bovinus*, Fries.

Boletus bicolor, *Massee*.

Pileus pulvinatus, dein plus minusve depresso-undulatus, glaber, siccus, aurantiacus centro obscuriore, 5–6 cm. latus. *Tubuli* stipiti adnati vel subdecurrentes, albidi, 3–4 mm. longi; pori elongato-hexagoni, ampli, albidi. *Stipes* farctus, solidus, sursum incrassatus, glaber, pileo concolor, 4–5 cm. longus, sursum 1 cm. crassus. *Sporae* fusiformae, albidae, flavo-tinctae, 7–8 × 4 μ. *Caro* spongiosa, albida, 1–1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 56, ser. 2.

Readily distinguished by the orange-coloured pileus and stem and the white pores. Allied to *Boletus versipellis*, Fries.

Boletus umbilicatus, *Massee*.

Pileus convexus, profunde umbilicatus, siccus, glaber, flavido-roseus, costis pallidis anastomosantibus eximie reticulatus, margine albidus, 4–6 cm. latus. *Tubuli* elongati, stipiti adnati vel subdecurrentes, flavo-virentes; pori maximi, angulati, virescentes. *Stipes* solidus, sursum leviter incrassatus, longitudinaliter striatus, pileo concolor, 6–7 cm. longus, 1 cm. crassus, subinde subflexuosus. *Sporae* fusiformae, viridi-flavescentes, 8–9 × 5 μ. *Caro* compacta, albida, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 78, ser. 2.

A very distinct and interesting species, remarkable alike for the deeply umbilicate pileus, a character unique in the genus, so far as at present known; the pileus ornamented with raised ribs, anastomosing to form an irregular network; and in the tufted habit of growth. Approaching *Boletus caespitosus*, Massee, in habit; differing in the longer tubes and very large, angular pores.

Boletus Alwisii, *Massee*.

Pileus carnosus, compactus, pulvinatus, glaber, flavidus centro saturatiore, margine albido infractus, 3–4 cm. latus. *Tubuli* breves,

stipiti adnati, flavescentes; pori parvi, subrotundi, flavidi, tactu virescentes. *Stipes* solidus, deorsum attenuatus, pileo concolor vel pallidior, supra annulum reticulatus, infra concentrice squamulosus, 5–6 cm. longus, 0·5 cm. crassus. *Sporae* oblongo-fusoideae, subhyalinae, 6–7 × 4 μ. *Caro* albida, 0·5 cm. crassa, versus marginem tenuissima.

SINGAPORE. On the ground, *Ridley*, 42 & 95, ser. 2.

A very beautiful little *Boletus*, of a clear yellow colour throughout, belonging to the section including *Boletus luteus*, L., and *B. flavus*, With. The illustration indicates that *B. Alwisii* is gregarious in habit.

Boletus tristiculus, *Massee.*

Pileus convexo-explanatus, undulatus, siccus, pulverulentus, margine lobatus, griseo-lividus, 8–9 cm. latus. *Tubuli* concolores, elongati, circa stipitem profunde depressi; pori angulati, ampli, griseo-rufescentes. *Stipes* solidus, elongatus, sursum attenuatus, supra annulum obsoletum pallidus, reticulatusque, infra subsquamulosus squamulis compressis, 8–9 cm. longus, 2–3 cm. crassus. *Sporae* fusiformae, pallidae, 8–9 × 4·5 μ. *Caro* compacta, albida, fracta subcinerascens, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 80, ser. 2.

A somewhat dingy-looking fungus, the prevailing colour being a livid grey. Allied in structure to *Boletus chrysenteron*, Fries.

Boletus albellus, *Massee.*

Pileus pulvinatus, carnosus, expanso-depressus vel undulatus, siccus, glaber, albus, 8–10 cm. latus. *Tubuli* albido-flavi, liberi; pori concolores, angulati vel sinuato-oblongi, ampli. *Stipes* farctus, subaequalis vel leviter basi incrassatus, concolor, undique reticulatus, maculis flavescentibus variegatus, 8–9 cm. longus, 2–3 cm. crassus. *Sporae* fusiformae, pallide flavo-virides, uniguttulatae, 10–12 × 6–7 μ. *Caro* albida, fracta sublutea, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 11, ser. 2.

A very distinct species, characterised by the pileus becoming more or less depressed and undulated with age, the white colour of every part, a tinge of yellow only appearing in the tubes and on the stem, and more especially by the sub-equal stem being everywhere covered with raised ribs, anastomosing to form an irregular network. Allied to the group of species of which *B. chrysenteron*, Fries, may be accepted as typical.

Boletus pachycephalus, *Massee.*

Pileus pulvinatus, velutinus, brunneus centro saturatiore, 5 cm. diam. *Tubuli* brevissimi, stipiti adnati vel decurrentes, ex albo sublutescentes; pori angulati aut sinuoso-elongati, mediocres, roseo-rufescentes. *Stipes* solidus, curtus, basi incrassatus, nigro-brunneus, glaber, 2–3 cm. longus, 1·5 cm. crassus. *Sporae* ellipsoideae, flavo-virides, 8–9 × 4 μ. *Caro* alba, immutabilis, crassissima, compacta.

SINGAPORE. On the ground, *Ridley*, 24, ser. 2.

Remarkable for the very dark colour of the stem and pileus, very short tubes, and exceedingly thick, compact, unchangeable flesh. Allied to *B. chrysenteron*, Fr.

Boletus funerarius, *Massee.*

Pileus carnosus, e subhemispherico expansus depressusve, subumbonatus, siccus, velutinus, atro-brunneus, interdum centro squamulosus, 8–10 cm. latus. *Tubuli* stipiti adnati, elongati, fuscescentes ; pori magni, elongato-hexagoni, brunnei. *Stipes* farctus, aequalis, longitudinaliter fibroso-striatus, brunneus, 5–6 cm. longus, 1–5 cm. crassus. *Sporae* fusiformae, leniter curvatae, olivaceo-griseae, 9–10 × 4–4·5 μ. *Caro* compacta, alba, 2 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 50, ser. 2.

A sombre, uninviting species, characterised by brownish-black velvety pileus and brown tubes and pores. The general structure approaches that of *Boletus chrysenteron*, Fries.

Boletus Ridleyi, *Massee.*

Pileus pulvinatus, velutinus, hinc inde lacunosus vel quasi alveolatus, laete incarnatus, siccus, 8–9 cm. latus. *Tubuli* elongati, adnati, flavo-virentes : pori angulati vel elongato-hexagoni, tubuli concolores. *Stipes* farctus, peraltus, sursum attenuatus, alveolatus alveolis elongatis, pileo concolor, sursum flavicans, 12–15 cm. longus, ad basin 3 cm. crassus. *Sporae* fusoideae, olivaceo-tingentes, 12–13 × 5 μ. *Caro* albida, spongiosa vel cavernosa, fracta subrubescens.

SINGAPORE. On the ground, *Ridley*, 87, ser. 2.

A very beautiful and distinct species, characterised by the clear flesh-coloured, velvety pileus, and the very long, alveolate, red stem. Allied to *B. subtomentosus*, L., and *B. impolitus*, Fries.

Boletus unicolor, *Massee.*

Pileus pulvinatus, levis, glaber, ochraceus centro fuscidulo, margine primo involuto dein fisso, 9–10 cm. latus. *Tubuli* ochraceo-virentes, adnati vel subdecurrentes ; pori angulati ampli, ochraceo-rufescentes. *Stipes* solidus, elatus, deorsum attenuatus, fibroso-striatus, pileo concolor, 10–12 cm. longus, sursum 2·5 cm. crassus. *Sporae* pallide ochraceae, oblongo-ellipticae, 11–12 × 5 μ. *Caro* persistenter alba, crassa, compacta.

SINGAPORE. On the ground, *Ridley*, 99, ser. 2.

Readily distinguished by the ochraceous colour of every part, the elongated, fibrillosely striated stem, tapering downwards. Belongs to the section of the genus including *Boletus bovinus*, Fries.

Boletus longipes, *Massee.*

Pileus convexo-planus, in exoletis centro plus minusve depressus, viscosus, glaber, griseus centro saturatiori, 3–4 cm. latus. *Tubuli* elongati, flavo-virentes, liberi ; pori angulati, ampli, griseo-flavidi, marginibus flavi. *Stipes* solidus, elongatus, subaequalis vel basi subincrassatus, flexuosus, glaber, pileo concolor, basi albus, 7–8 cm. longus, 2–3 mm. crassus. *Sporae* flavo-brunneae, ellipsoideae, leniter curvatae, 12 × 5 μ. *Caro* alba.

SINGAPORE. On the ground, *Ridley*, 81, ser. 2.

Remarkable for the long, slender, flexuous stem. The pileus is plane, becoming depressed at the centre when old. This species is probably gregarious, as nine excellently preserved specimens accompanied the coloured drawing. Approaching *B. fuligineus*, Fries, in general structure.

Boletus parvulus, *Massee.*

Pileus hemisphaerico-explanatus, obtusissime umbonatus, margine integro undulato, minute squamulosus, pulchre flavo-fulvescens centro obscuriore, 5–6 cm. latus. *Tubuli* in stipite subdecurrentes, curti, cinerascentes ; pori minutissimi, rotundati, roseo-tincti. *Stipes* solidus, sursum incrassatus, glaber, pileo concolor, 4–5 cm. longus, supra 1–5 cm. crassus. *Sporae* cymbiformae, vix carneo-tinctae, 7–8 × 5 μ. *Caro* spongiosa, 1·5 cm. crassa, albida.

SINGAPORE. On the ground, *Ridley*, 56 bis, ser. 2.

A very neat, clear-coloured fungus, characterised by the tawny-yellow pileus and stem, and the rose-tinted pores.

Allied in general structure to *Boletus rufo-aureus*, Massee ; differing in the smaller size, minutely squamulose pileus and rosy pores.

Boletus nanus, *Massee.*

Pileus pulvinatus, carnosus, interdum undulatus, siccus, primitus levis dein centro rimoso-areolatus, olivaceo-fuscus, 1–1·5 cm. latus. *Tubuli* subliberi, curti, flavescentes ; pori angulosi, pro ratione magni, flavo-virentes. *Stipes* solidus, plus vel minus flexuosus, æqualis, luteus apice roseus furfuraceusque, 4 cm. longus, 3–4 mm. crassus. *Sporae* fusoideae, flavido-albae, 6 × 3·5 μ. *Caro* compacta, albida, versus marginem tenuissima.

SINGAPORE. On the ground, gregarious, *Ridley*, 39, ser. 2.

A very beautiful and well-marked species, reproducing in miniature all the characteristic features of *Boletus chrysenteron*, Fries.

Boletus flexipes, *Massee.*

Pileus tenuis, e convexo planus, interdum centro depressus, glaber, castaneus, zona lata umbrina in medio pilei ornatus, 4–5 cm. latus. *Tubuli* in stipite subdecurrentes, curti, flavescentes ; pori rotundati, minutissimi, aurei. *Stipes* solidus, flexuosus, sursum attenuatus, pallidus vel tinctura leviter rubescente-flavida praeditus, 6 cm. longus, 6–8 mm. latus. *Sporae* oblongo-fusoideae, interdum curvulae, 7–9 × 5 μ. *Caro* 3–4 mm. crassa, compacta.

SINGAPORE. On the ground, *Ridley*, 97, ser. 2.

A very beautiful species, readily recognised by the plane, chestnut-coloured pileus, golden pores, and pallid, flexuous stem. Its affinity is with *Boletus vaccinus*, Fries.

Boletus flavipes, *Massee.*

Pileus primo hemisphaericus, dein modice explanatus, margine non vel vix curvulus, dein gradatim expansus, laevis, glaber, sordide castaneus, 3–4 cm. latus. *Tubuli* stipiti adnati, curti ; pori rotundati, minuti, albi. *Stipes* teres, subflexuosus, farctus, aetate cavus, flavus, 4 cm. longus, 5–6 mm. crassus. *Sporae* fusiformae, subhyalinae, 6–7 × 3·5 μ. *Caro* compacta, 1 cm. crassa, albida.

SINGAPORE. On the ground, *Ridley*, 25, ser. 2.

A very neat little species, characterised by the white tubes and pores and the slightly flexuous, yellow stem. Allied to *Boletus tenuipes*, Cooke.

Strobilomyces paradoxus, *Massee.*

Pileus carnosulus, margine abrupte tenuis, incurvus, primo hemisphaericus, dein explanatus, umbrinus, dense irregulariterque verrucosus, aetate glabrescens, 6–7 cm. latus. *Tubuli* curtissimi, stipiti adnati; pori polygoni seu alveolati, brunnei. *Stipes* farctus, subaequalis, glaber, pileo concolor, 4–5 cm. longus, 5–6 mm. crassus. *Sporae* oblongo-ovatae, basi oblique apiculatae, longitudinaliter striatae, flavo-brunneae, 9–11 × 5 μ.

SINGAPORE. On the ground, gregarious, *Ridley*, 28, ser. 2.

A very remarkable species, possessing features characteristic of the genera *Boletus* and *Strobilomyces* respectively. It approaches the last-named genus in the characteristic dusky brown colour; warted pileus becoming glabrous when old; oblong form of spores, with an ornamented epispore. On the other hand, all previously known species of *Strobilomyces* have a very fleshy pileus, shaggy stem, and long tubes. The points in common with *Boletus* are smooth stem, short tubes, as in *B. flexipes*, Mass., and thin flesh, as in *B. bovinus*, L.

XXV.—MYROBALANS.

(*Terminalia Chebula*, Retz.)

The following article on this important tanning material of commerce, to which some additional information is added, appeared in the *Indian Forester*, 1907, p. 362 :—

"On the Western Ghauts this species does not usually exceed a height of 25 feet or a girth of 3½ feet. The bole as a rule is very short, branching often beginning lower than 2 feet from the ground. The crown is very spreading and the root system shallow. The species is essentially light-demanding. It flourishes on laterite at an altitude of 4,500 feet; here its chief associate is *Eugenia Jambolana*. The new foliage appears about the beginning of April, soon after which the flowers, all bisexual, are displayed in spikes; on an average there are about 40 flowers in each inflorescence, but the number of ovaries ultimately developing into fruit on a single peduncle does not usually exceed 10. The leaves are mostly sub-opposite, glabrous, shining and coriaceous, measuring 3-6 in. by 2–2 in.

"The fruit (the Myrabolam of Commerce), which is a drupe ovoid in shape and an inch long by half an inch broad in the middle, is also glabrous and appears about the end of May. It is at this time light green with tiny yellow spots; the upper part, perhaps on account of the influence of stronger light, frequently changes to a dark purple maroon.

"During the monsoon the fruit turns a greenish yellow. At this period the 'hirda' (this is the name by which the fruit is known to the Maharatta) is sold by auction whilst on the tree, and materially adds to the revenues of those Forest Divisions situated in the *T. Chebula* zone.

"The successful bidder begins collecting in October, and for his convenience depôts are erected at suitable centres, serving also the

double purpose of housing guards. Villagers collect the fruit in bags, baskets and blankets, conveying it to the nearest depôt, where individual collections are measured and payment made by the contractor at the rate of six pies per 'adshiree'; this is a cylindrical measure 4½ inches in diameter and 10½ inches in depth.

"Collecting operations continue up to the end of March, most of the hirda at this particular time being quite yellow. The fruit at the depôt is at once spread out on ground specially prepared; all grass, loose sand and dirt are cleared away, the area being well swept until its surface resembles that of a clean threshing floor. The hirda, having been spread evenly and in a single layer over the ground, is turned over every second or third day to ensure perfect drying in full sun-light, for it is mainly on this process that the ultimate commercial value of the myrabolam depends. On an earthy floor drying occupies, in fine weather, a period lasting twenty days, but on a rocky area this period is about halved, owing to the amount of heat received by rocks during the day and retained for some time after sunset. Moreover, when the dew falls the moisture is more quickly evaporated from a rocky than from an earthy surface.

"A few showers of rain destroy the valuable properties of hirda; to contend against any emergency, therefore, the contractor builds one or two temporary sheds, in which the hirda is quickly stored as soon as the sky becomes threateningly cloudy. The fruit when perfectly dry is a little larger than half its original size. During the drying process it becomes ridged, and then the outer layer of the pericarp is hard enough to resist the blade of a penknife. A small percentage of the hirda, however, does not become ridged, and in such cases it is found that almost the whole of the interior of the fruit has turned into a black powder which is much used for making ink; such fruits, known by the natives as 'bhonga' hirda, are considered worthless for dyeing and tanning purposes. The ridged, or valuable dry, hirda is next stored in bags and despatched to Europe, a comparatively small quantity being retained for sale in this country. Various decoctions prepared from the chebulic myrabolam are used as cathartics by natives.

"The natural reproduction of *Terminalia Chebula* is generally good. Once germination has taken place the young seedling soon establishes itself, and in spite of repeated fires sweeping through the area the plantlet quickly recovers, thus exhibiting great tenacity of life. Stools, the result of illicit exploitation, coppice vigorously. The leaves of the seedling and coppice shoot are tomentose, but this character soon wears away. For purposes of artificial restocking a reservation is made by the Forest Department to the extent of one maund (24 adshirees) per beat of the forests in which hirda is found. Germination is generally backward with regard to the ridged hirda; but that known as 'bhonga' readily germinates, because the hard, stout nut has been transformed into a black powder, and this destruction of the pericarp would appear to be due to a fungus. If this is a fact, then we have an instance of a fungus doing good, instead of the usual harm, by removing the endocarp which, in the ridged hirda, seems to be the chief obstacle

to successful germination. It is most probable also that a fire may do some good in the case of hirda, as it has been said to do in the case of teak.

"Injury is done to the inflorescence by a species of *Cynipidae*. This insect causes fairly large, irregularly shaped, red galls on the peduncle, and in doing so destroys several of the flowers. It therefore is responsible for a large reduction in the crop of the year. The nearer the gall is situated to the base of the peduncle the greater must be the amount of harm done since the gall or galls, to remain in a healthy condition, must undoubtedly assimilate a certain quantity of the nourishment during its passage up the main food channel of the inflorescence. Further, the terminally situated flowers (or fruit) must suffer most, and may, because of this deprivation of nutriment, die eventually, the degree of deprivation depending on the size and number of the galls. Species of *Rodentia*, such as the squirrel and rat, devour the fruit voraciously in plantations.

"The wood is considered useful by villagers for carts and agricultural implements, but this will always remain a secondary consideration in comparison with the fruit.

"In felling operations *T. Chebula* is, of course, reserved, and it would be advantageous to prescribe a sylvicultural rule to the effect that the crown should be given full freedom to spread in all directions. Being thus favoured, more light would result in an increase of foliage and the quantity of fruit would also correspondingly increase.

"A tree yielding annually such valuable produce is certainly good capital. The majority of timber-producing species reach the age of exploitability when about from 90 to 120 years old; there is no reason to doubt that *T. Chebula* does attain such an age, and indeed continue beyond it, regularly producing from about its fifteenth year a steady interest in the form of fruit."

To Messrs. Dalton & Young, Fenchurch Street, London, E.C., we are indebted for the following particulars of the commercial varieties of myrobalans distinguished in the English market together with the present value per cwt. C.I.F., United Kingdom ports.

	Picked.	Nos. 1.	2.	3.
	s. d.	*s. d.*	*s. d.*	*s. d.*
From Bombay.				
Bhimlies	7 3	6 6	4 10½	—
Jubbulpore ...	6 3	5 7½	4 10½	—
Rajapore	6 0	5 4½	4 9	—
Vingorlas	—	5 3	4 7½	—
From Calcutta.				
Central Indian ...	—	5 9	5 0	4 6
Calcutta	—	5 6	4 9	4 0
From Madras.				
Fair Coast ...	—	4 10	—	—

In recent years Jubbulpores have been shipped in a crushed form with the kernels extracted. This was formerly done by hand, now by a crushing machine.

The total exports of myrobalans from India for the year 1908 are as follows :—

	Cwts.	*Value.*
United Kingdom ...	1,013,878 ...	£244,712
Germany	291,526 ...	82,976
Belgium...	225,484 ...	63,992
Other Countries ...	252,304 ...	67,113
	1,783,192 ...	£458,793

XXVI.—DIAGNOSES AFRICANAE : XXIX.

1021. **Triplochiton nigericum**, *Sprague* [Sterculiaceae-Mansonieae], a speciebus adhuc descriptis foliis septemlobis lobis oblongis recedit.

Arbor alta ligno albido molli. *Folia* decidua, septemloba, 12–22 cm. longa, 15–26 cm. lata, lobis oblongis subabrupte acuminatis ; petioli 5–9 cm. longi ; stipulae mox deciduae, arcuatae, 1·5–2 cm. longae, acutae, apice pilosae. *Cymae* in axillis foliorum delapsorum ortae ; bracteolae 3, late ovatae, in articulatione pedicelli insertae. *Calycis tubus* 2–3 mm. longus ; lobi ovati, 6 mm. longi, 3·5–4 mm. lati. *Petala* obovata, 1 cm. longa, 9 mm. lata, inferne rubro-brunnea, superne alba, dense villosa, appendice squamiformi tomentoso 0·5 longo in ungue 1 mm. supra basin inserto primum erecto tandem reflexo. *Discus* nectariferus pentagonus, planus, fundum calycis vestiens, angulis antipetalis. *Gonophorum* 3 mm. longum, acute 5-angulatum angulis antisepalis dense pubescentibus. *Stamina* 44–46 ; filamenta 2–3 mm. longa, per paria inferne connata ; antherae monothecae. *Staminodia* antisepala, late ovato-oblonga, convexa, 3 mm. longa, inferne pellucide areolata. *Carpella* antipetala ; ovarium anguste angulato-ovoideum, 2 mm. longum, extrorse dense papillosum ; stylus 1 mm. longus, pilosus. *Fructus* 1 cm. longus ala exclusa, superne dense villosus, ala 3–3·5 cm. longa.

Southern Nigeria. Oloke Meji, *Foster*, 370 ; Ibadan Forest Reserve, *Punch*, 125 ; Jebu Ode, *Punch*.

According to Mr. Punch it is the commonest tree in the Lagos forests, and is known by the native name "Arere." It sheds its old leaves just before, or at the time of flowering.

In the original description of *Triplochiton* the position of the staminodes and carpels was not stated ; the staminodes are antisepalous and the carpels antipetalous, just as in *Mansonia*. The disc and the appendage to the petal are present also in *T. Johnsonii*, but have not hitherto been described. The petal appendage, which is at first erect, finally becomes reflexed parallel to the claw, and is then inconspicuous.

In all the species of *Triplochiton* of which flowers are known the filaments are connate below in pairs, and the anthers appear to be monothecal. A flower-bud of *T. scleroxylon* selected for examination had both stamens and carpels, both apparently functional, and

the flowers in this species are probably polygamous. As the leaves resemble those of *T. Johnsonii*, it is possible that the relationship between these two species is closer than was at first thought.

1022. **Dicraea tenax**, *C. H. Wright in Dyer*, *Fl. Trop. Afr.* vi. sect. 1. part i. p. 125 (anglice) [Podostemonaceae-Eupodostemoneae]; *D. Wallichii*, Tul., affinis, foliis pluribus trilobis recedit.

Planta cornea, aenea. *Caulis* ramosissimus, leviter compressus, 1 mm. diam. *Folia* numerosa, inferiora laxe disposita, superiora imbricata, quadrata, triloba, vix 1 mm. longa. *Spathellae* tubulares, irregulariter dentatae, virides, 2 mm. longae; pedicelli in aestivatione inflexi; bracteae foliis similes. *Stamina* 2; filamenta dimidio inferiori connata; antherae 2-loculares. *Stigmata* linearia, deflexa. *Capsula* 2-valvata, 2 mm. longa, vix 1 mm. diam.; valvae aequales, 5-nervae, apice edentatae.

Rhodesia. Livingstone Island, Victoria Falls, growing in the very swirl of the rapids, *Kolbe*, 3149.

This much resembles the Brazilian *Podostemon Chamissonis*, Tul., in habit.

1023. **Dicraea Garrettii**, *C. H. Wright in Dyer*, *Fl. Trop. Afr.* vi. sect. 1. part i. p. 126 (anglice) [Podostemonaceae-Eupodostemoneae]; *D. tenaci*, C. H. Wright, affinis, bracteis longe laceratis differt.

Caulis ad 10 cm. longus, ramosus, compressus, corneus. *Folia* laxe disposita, circa 2 mm. longa, irregulariter lobata. *Flores* in fasiculos terminales dispositi; pedicelli ante anthesin inflexi, demum 12 mm. longi; bracteae 6 mm. longae, basi vaginantes, parte superiore laceratae; spathellae tubulares, uno latere fissae, 4 mm. longae. *Perianthii* segmenta parva, linearia. *Filamenta* 4 mm. longa, ovarium superantia, ultra medium connata. *Ovarium* ellipsoideum, costatum; stigmata subulata; gynostemium 1 mm. longum. *Capsula* 1·75 mm. longa, 1 mm. diam.; valvae aequales, 3-costatae.

Tropical Africa. Sierra Leone; Sherboro, *Garrett*.

1024. Aristolochia rigida, *Duch.*, var. major, *C. H. Wright in Dyer*, *Fl. Trop. Afr.* vi. sect. 1. part i. p. 139 (anglice) [Aristolochiaceae]; a typo notis sequentibus differt.

Folia 7·5 cm. longa, prope basin 6 mm. lata. *Bracteae* 3·8 cm. longae, 8 mm. latae, ovato-lanceolatae, longe acuminatae, mucronatae, marginibus incrassatis scabridis. *Perianthium* 3·8 cm. longum; limbus 2·5 cm. longus vel ultra.

Somaliland. Lasgori and Ahl Mountains, about 480 m., *Hildebrandt*, 873.

This variety has a very different aspect from the type, which may be due to growing in a moister locality. The difference in the shape of the bracts is very striking.

1025. **Aristolochia Kirkii**, *Baker in Dyer*, *Fl. Trop. Afr.* vi. sect. 1. part i. p. 139 (anglice) [Aristolochiaceae]; *A. Mannii*, Hook. f., affinis, perianthii limbo unilaterali distinguitur.

Caules tenues, scandentes, primum pubescentes, demum glabri. *Folia* triloba, subcoriacea, supra sparse verrucosa, subtus ad nervos pubescentia, 7·5 cm. longa; lobus terminalis oblongus, obtusus, circa 2 cm. latus, nervis 3 primariis parallelis; lobi laterales rotundati, 1·8 mm. diam., 3-nerves, sinu lato sejuncti; petioli

tenues, 1 cm. longi, pubescentes. *Cymae* axillares, pauciflorae; bracteae ovatae, 2 mm. longae, pubescentes. *Perianthium* basi subglobosum, 4 mm. diam.; tubus 10 mm. longus, ore 6 mm. diam., inferne cylindricus, superne infundibuliformis, uno latere emarginatus, altero in limbum lanceolatum 6 mm. latum plus quam 12 mm. longum productus. *Gynostemium* subsessile. *Stamina* 12; antherarum loculi lineares, quam gynostemium duplo breviores. *Styli* rami subulati.

Portuguese East Africa. Lower Zambesi; Shiramba, *Kirk*. Lower Shire River; Moramballa, 917 m., *Kirk*.

The apex of the perianth-limb has been broken off all the flowers I have seen.

1026. **Piper brachyrhachis**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 147 (anglice) [Piperaceae-Pipereae]; *P. pseudosilvatico*, C. DC., affine, ramis pubescentibus differt.

Frutex 2 m. altus. *Rami* pubescentes. *Folia* ovata, acuminata, basi rotundata, 5–7-nervia, subtus dense villosa, supra glabra, 14 cm. longa, 9 cm. lata; nervi laterales 2–4, e laminae basi ipsa orti, reliqui suprabasilares; petioli 2·5 cm. longi, supra canaliculati, villosi. *Pedunculus* tenuis, 1·8 cm. longus, villosus; spica 10 mm. longa; bracteae peltatae, glabrae, albae; flores polygami. *Stamina* 3; filamenta complanata; antherarum loculi segregati. *Ovarium* ovoideum, compressum; stigmata 2.

British Central Africa. Nyasaland, between Mpata and the commencement of the Tanganyika Plateau, 600–900 m., *Whyte*; Nyika Plateau, 1200–2100 m., *Whyte*, 199.

1027. **Peperomia crassifolia**, *Baker in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 154 (anglice) [Piperaceae-Pipereae]; *P. Mannii*, Hook. f., affinis, foliis crassis opacis differt.

Caulis decumbens, 2 mm. crassus, glaber, circa 3 dm. longus. *Folia* alterna, orbicularia, obtusa, basi rotundata, 1·4 cm. longa, crassa, opaca, supra glabra, subtus sparse pubescentia; costa per totam laminam conspicua; nervi laterales inconspicui, ascendentes; petioli 4 mm. longi. *Spicae* terminales et laterales, tenues, ad 7 cm. longae; rhachis glaber; pedunculi glabri, 1·5 cm. longi. *Ovarium* sessile, globosum; stigma terminale.

Uganda. Wimi Valley, Ruwenzori, 2079 m., *Scott-Elliot*, 7928.

1028. **Chloropatane Batesii**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 169 (anglice) [Monimiaceae]; a *C. africana*, Engl., foliis basi cuneatis nervisque lateralibus paucioribus distinguitur.

Frutex 1–2 m. altus. *Rami* tenues, teretes, cinerei, glabri. *Folia* elliptica, cuspidata, basi cuneata, 13 cm. longa, 5 cm. lata, tenuiter membranacea, dilute viridia, subtus minute verrucosa, ad nervos primarios puberula, caeterum glabra; nervi laterales utrinque 4–6, tenues, intra margines arcuatim connexi; petioli 1 cm. longi, puberuli. *Racemi* axillares prope ramorum apices; pedunculi tenues, 2 cm. longi; pedicelli filiformes, 1·8 cm. longi. *Flores* masculi 5 mm. diam. *Perianthium* breviter 4-lobatum, viride, glabrum, ante anthesin globosum. *Antherae* obovoideae. *Flores* feminei ignoti.

Tropical Africa. Cameroons; Efulen, *Bates*, 409.

1029. Tylostemon (Ennearrhena) sessilifolius, *Stapf in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 175 (anglice) [Lauraceae-Perseeae]; ab omnibus speciebus notis foliis sessilibus basi cordatis distinctus.

Frutex (vel arbor ?) ramulis robustis exsiccando cinerascentibus glabris. *Folia* sessilia, oblanceolato-oblonga, in acumen angustum ad 2·5 cm. longum producta, basi cordata auriculis rotundatis, ad fere 40 cm. longa et ultra 10 cm. lata, papyracea, glabra, exsiccando fusca, nervis lateralibus utrinque circiter 12 ascendentibus inferioribus multo magis obliquis quam superioribus, venarum reticulatione utrinque prominula. *Panicula* ultra 7·5 cm. longa, 5 cm. lata, subgracilis, superne tenuiter pubescens; pedunculus brevis; rami inferiores distantes, ad 5 cm. longi, supra medium multiflori; ramuli ultimi ordinis et pedicelli brevissimi, tenues. *Perianthium* subgloboso-turbinatum, 1·5 mm. longum, extus minutissime pubescens, segmentis rotundatis receptaculo aequilongis. *Stamina* introrsa, filamentis antheras aequantibus ad earum bases et secus lineam mediam minute pilosis; stamina extrorsa connectivo pilosulo basi utrinque glanduligera; staminodia triangularia. *Afrodaphne sessilifolia*, Stapf, in *Journ. Linn. Soc.*, vol. xxxvii., p. 111, et *Beilschmiedia sessilifolia*, Engl. ex Stapf, l.c. [nomina tantum].

West Africa. Cameroons, Bipinde, *Zenker*, 2256!

When I described the genus *Afrodaphne* in the *Journal of the Linnean Society* in 1905 (vol. xxxvii., p. 110), I was well aware of Engler's genus *Tylostemon*, described in 1899; but there were then no specimens of the species referred to it at Kew, and the fact that the description of *Tylostemon* followed the descriptions of several species of *Beilschmiedia* in Engler's paper, as well as the statement that the staminal glands of *Tylostemon* were adnate to the filaments all along led me to the conclusion that *Tylostemon* and the African Beilschmiedias belonged to two distinct genera. As the African Beilschmiedias appeared to me to differ generically from the original Beilschmiedias of the Indo-Malayan region, I made them into a distinct genus *Afrodaphne*. Since then I have had an opportunity of examining the original species of *Tylostemon*, thanks to the courtesy of Professor Engler, and found that his African Beilschmiedias, and therefore my species of *Afrodaphne*, are congeneric with *Tylostemon*. The staminal glands of the original Tylostemons are very like those of Engler's African Beilschmiedias, and they are attached in the same way, as may also be seen from the rather diagrammatic figures on plate ix. of Engler's paper.

The affinity of *Tylostemon* lies rather with the American genus *Hufelandia* than with *Beilschmiedia* proper, and the authors of the *Genera Plantarum* (vol. iii., p. 152) actually referred Meisner's *Oreodaphne minutiflora*, *O. Mannii*, and *O. gaboonensis* (that is *Tylostemon minutiflorus*, *T. Mannii*, and *T. gaboonensis*) to the section *Hufelandia* of their *Beilschmiedia*. Both *Hufelandia* and *Tylostemon* have always a distinct receptacle, against the very deeply divided perianth of *Beilschmiedia*; but *Hufelandia* differs from *Tylostemon* in the leaves being more or less glaucous-pruinose below, and in having the connective produced at the apex, and the styles very short. Both form fairly homogeneous groups.

1030. Tylostemon grandifolius, *Stapf in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 177 (anglice) [Lauraceae-Perseae] ; a speciebus sectionis *Ennearrhenae* perianthio pro genere masusculo (2 vel ultra 3 mm. longo) donatis indumento inflorescentiae copioso et receptaculo angustius campanulato distinctus.

Ramuli robusti, exsiccando fusci. *Folia* oblanceolato-oblonga, brevissime acute acuminata, sensim basi attenuata, 15–25 cm. longa, 7–9 cm. lata, coriacea, glabra, nervis lateralibus utrinque 6–7 perobliquis, venis laxe anastomosantibus utrinque prominulis ; petiolus robustus. *Paniculae* subterminales, floribundae, ad 12 cm. longae, et 8 cm. latae, undique minute fulvo-tomentellae ; pedunculus brevis, compressus ; rami inferiores ad 5 cm. longi, ad 2–2·5 cm. indivisi ; ramuli ultimi ordinis pedicellique raro ad 2 mm. longi. *Perianthium* campanulatum, 3 mm. longum vel paulo longius, minutissime puberulum ; receptaculum segmentis ovatis vel rotundatis aequilongum vel paulo longius. *Stamina* introrsa filamentis papillosis antheras aequantibus basi subattenuatis ; stamina extrorsa filamentis sublinearibus dense tomentellis utrinque glanduligeris ; staminodia subcordato-triangularia. *Ovarium* sensim in stylum aequilongum attenuatum. *Afrodaphne grandifolia*, Stapf in *Journ. Linn. Soc.* xxxvii. 111 (nomen) ; *Cryptocarya ? grandifolia*, Engl. ex Stapf, l.c.

West Africa. Cameroons, Bipinde, *Zenker*, 2250, 2250*a*.

XXVII.—THE VEGETATION OF THE PASTASA AND BOMBONASA RIVERS.

The following notes by Richard Spruce on the vegetation of these tributaries of the Marañon branch of the Amazon on the lower eastern slopes of the Ecuadorean Andes have been sent to the Director by Dr. Alfred Russel Wallace. The account of Spruce's hazardous journey in this remote and almost unknown region has already been published in Chapter xvii. of the second volume of the "Notes of a Botanist on the Amazon and Andes" edited by Dr. Wallace. It had been the intention of the Editor to make a short chapter on the vegetation notes in the book, but since they are somewhat fragmentary and essentially botanical it was decided to omit them.

The journey up the rivers Pastasa and Bombonasa—a distance of nearly 500 miles—which occupied about three months, was made entirely in canoes. After a journey of about 19 days from the junction of the Pastasa with the Marañon, Spruce reached Andoas at the mouth of the Bombonasa whence he travelled to Canelos. In the course of the journey Spruce mentions the occurrence of tributary streams both of black and of clear water similar to those he had noticed on the Rio Negro. It was when at Puca-yacu that a terrific thunderstorm nearly brought the expedition to an untimely end ; the river, only 40 yards broad, and less than 3 feet deep at the particular spot where the canoes were moored, rose 18 feet during the night, and had it not been for the exertions of the Indians in hanging on to the strong lianas of a *Bignonia*, securely entwined in the branches

of the trees overhead, they would assuredly have been swept away to instant destruction by the roaring flood. Moreover, they were in constant danger of being dashed to pieces by the floating trees which were borne along by the torrent. It was not until after 10 o'clock on the following day that they were able to relax their efforts and feel themselves secure. Dr. Wallace has furnished a short prefatory paragraph to the extracts from Spruce's journal which follow :—

Notes on the Vegetation made during the Voyage up the Pastasa and Bombonasa.

[Interspersed throughout the Journal of this tedious canoe-voyage are very numerous observations on the general character of the vegetation as well as records of species identified as being known from other parts of the Amazon valley, or as being, probably or certainly, new species. It must be remembered that during this long journey it was quite impossible for Spruce to make any collections of flowering plants ; but he was so close and accurate an observer, and had by this time acquired such an extensive knowledge of the Amazonian flora, that I think it my duty to give some portion of these notes for the use of such botanists as may not be able to consult the original notes and Journals which have been presented to the Kew Herbarium.

Of the first portion of these notes, dealing with the banks of the Pastasa river, I shall only give a very small portion to illustrate their general nature, as the river was monotonous, and the notes of comparatively little interest. But those of the Bombonasa river are much more detailed and of a more varied character, both from the greater diversity of the river banks and the decided sub-Andean character the vegetation began to present. These will be quoted at considerable length, and will, I think, be worth the attention not only of specialists in the botany of tropical America, but of all who take a general interest in the varied phenomena presented by the vegetable kingdom in a region where it is developed in exceptional luxuriance and grandeur.]

Vegetation of the Pastasa (from Journal).—At two days up the river the vegetation is still Amazonian—much rice in places—plenty of Ingas—much *Omphalea diandra* (*Euphorbiaceae*) and Abilla—abundance of a Dioclea (*Leguminosae*) with bramble-like leaves. . . . Palms are fairly abundant—Mauritia, two Attaleas, one apparently the *A. excelsa*. . . .

April 16th. Same palms. . . . *Iriartea ventricosa*, scarce. . . . Assai abundant. . . . the Couroupita (*Lecythidaceae*) as at Tarapoto. . . . Pourouma (*Artocarpaceae*), Securidaca (*Polygalaceae*), a climbing Amaryllidea, &c.

A nutmeg (*Myristica mocoa*) is common, and another smaller species scarce. Twining Bignoniae and Malpighiaceae are common —one of the former with purple flowers seems new. A Gesnera on trees by the shore has the aspect of a Pilea ; it has yellow tubular flowers, while another with flowers and large red bracts is common. A Loganiaceous twiner (*Uncaria guianensis*) is rather frequent.

Castanella riparia and a yellow-flowered Bauhinia (*Schnella*) were also seen ; but the vegetation on the whole is miserably monotonous and Amazonian.

April 17th. On the ground in some places there are beds of a delicate Gesnera with white flowers, in habit like a larger-leaved *Chrysosplenium*. Sometimes on the edge of banks only a few inches above the water there is a beautiful fringe of *Gymnogramme calomelanos*.

April 22nd. A Davilla (*Dilleniaceae*) on the margins is just opening its sulphur-yellow, odoriferous flowers. Of trees with tall clear trunks, often white with rudimentary lichens, is a fig with lanceolate leaves ; an Acacioid tree with largish bipinnate leaves and numerous fine leaflets—habit of a Dimorphandra or a Pentaclethra.

Myrtles are very rare, but a small-leaved Myrcia does occur. The forest in some places is almost entirely composed of the Lecythidaceous tree allied to Gustavia (*Grias* sp.) mixed with Chapaja palms ; also a tall palm with small grey fruits like those of an Astrocaryum, but it has no prickles ; some Geonomas, Bactrides, and small Cyclantheae forming undergrowth. Here it was pleasant getting about.

Triplaris guianensis (*Polygonaceae*), the Tangarána of the Peruvians, is everywhere too frequent, and the ants which infest it wound us daily.

April 22nd. *Ochroma* sp. (*Malvaceae*) with deeply cordate leaves is frequent on inundated shores, with *Cecropia peltata*, and is one of the trees most frequently encountered fallen in the water (as the river goes on drying) from banks giving way.

A curious Rubiaceous twiner with large leaves like those of a Nonatelia, large interpetiolar stipules, and largish yellowish flowers like those of a Cinchona.

There were two species of Ruyschia (*Marcgraviaceae*) : one very frequent has long branchlets with closely-set, almost linear leaves, and were it not for terminal umbels of red berries might almost be taken for a fern (*Pleopeltis*) as it hangs from trees.

Very frequent in woods is Paullinia, with dense clusters of flowers on the naked sulcate stem, surely same as from Coary—*P. rhizantha*.

On the margins of *tierra firme* an Urticaceous shrub (*Pilea* ?) with narrow leaves very like a Tarapoto species. Two composite herbs—one having much the aspect of Golden-rod, has long leaves, some trifid, some entire, very acute at base, and copious yellow flowers ; the other with similar flowers has broader cordate leaves. They occur on the inundated margin here and there, and exist also on the Bombonasa river.

Notes at Andoas.—Rainy weather, sore feet, the cares of engaging oarsmen and of procuring food for the voyage, left me small leisure for botany.

The last day of my stay I had a walk into the forest, which was cut short by the coming on of a heavy thunderstorm, and I returned *trempé comme un canard*. The track was very muddy as I went, but as I returned it was a little river with occasional lakelets. I noted another arborescent Alsophila, with subpilose fronds.

Other ferns were few, and common species. The mass of vegetation was similar to that in the moist forests of Yurimaguas, and the same Rubiacea with ternate leaves was frequent. There was also the large purple-flowered Nonatelia of Sao Paulo and Tarapoto. There happened to be no palms save a small Bactris, a Geonoma, and an Astrocaryum.

The most remarkable plant noted was a Byttneriacea—a small tree with a slender unbranched trunk, 18 feet high, bearing fascicles of large red flowers near the base of the trunk and a few large, alternate, stipulate, digitate leaves at the apex. [Probably a *Herrania*]. I saw but one plant, though perhaps the rain hindered me from seeing more. Some curious terrestrial Gesnerae, several small-flowered Melastomaceae, nearly all of species unobserved before —chiefly Miconiae and Clidemiae.

Vegetation of Bombonasa.—Near the mouth precisely the same as in the Pastasa. The Mulatto-tree (*Eukylista spruceana*, Benth.), *Eriodendron Samauma?* Homaliacea, *Erythrina Amasisa*, Pithecolobium, as frequent as on the Pastasa. A Loganiaceous twiner is especially abundant. The small-leaved Ingas are not so abundant. They are known here, as on the Huallaga, by the name of Chimbillas, and were a great hindrance to our progress on the Pastasa, especially in the Encañadas (side-channels), as they always grow hanging far over, and into, the water, and we must necessarily go round them, instead of close by the margin, so that we had to oppose a stronger current. Their roots spread wide and intricate, and when the earth gives way beneath them (for they generally grow on the extreme edge of terra firma) they fall over, but still hang on, while the Cecropias and most other trees fall prostrate, and are at length carried away by the stream.

Old trunks of the Chimbilla (*Inga* sp.) become hollow in the centre, and have often large quantities of wax and honey deposited in them, by a small blackish bee which does not sting. In the Setikas (as Cecropias are called) two (and most likely more) species of small bee deposit wax and very little honey ; one of these makes black wax, used chiefly for the fabrication of small candles—this abounds most on the Bombonasa ; the other makes white wax, but the whitest wax of all is obtained from the Chimbilla.

In order to obtain the wax the trees are cut down, and those portions of the trunk and branches ascertained to contain wax are carried away in a canoe to a convenient beach, where a fire is made. The wax being extracted is melted down in pans, and then poured off into calabashes, where the extraneous matter settles to the bottom, and the wax remains on the top. With two boilings the wax turns out very white and clear. This explains why the wax of Pastasa is in almost hemispherical masses ; on the Marañon, where large shallow vessels are used as moulds, it turns out in cakes.

I saw the Governor of Andoas pay the Indians a cutlass for every 6 lbs. of this wax they should get out. These cutlasses cost six reals each in Tarapoto, which makes the prime cost of wax a real a lb., or £58 6*s*. 8*d*. per ton ; but then there is the labour and

time of bringing cutlasses from Tarapoto or Nauta, and the months to wait before the Indians bring the wax, which they rarely ever do in full weight.

The narrow-leaved Pithecolobium much resembles Chimbillas in aspect and in clinging on by its roots although the trunk may have fallen over almost horizontally. The small pods resemble those of the Inga, but the seeds are not involved in sweet cottony pulp like those of the latter. The Indians in passing a tree of Chimbilla laden with pods as they are now, generally contrive to snatch a handful, and suck them when they rest on their oars a few moments. Like all fresh fruits they are unwholesome in an aguish river.

On the Bombonasa, as the current is not very strong nor the volume of water great, even Cecropias often do not fall entirely on slightly ascending shores from which the earth slides away as the water recedes. When thus half fallen over, they immediately begin to put forth buttresses from the lower part of them, as if by a species of instinct ; these buttresses are of very rapid growth, and soon get to be little inferior to the stem in thickness, so that a tree thus supported is with difficulty uprooted either by winds or water. I have noted the same peculiarity in nearly all the terrestrial Artocarpaceae and Moraceae I have seen in Amazonian forests.

Iriartea exorrhiza and *I. ventricosa* are very frequent near the margin and often growing together. *Mauritia vinifera* in some places is very lofty, the head rising entirely above the surrounding forest. There are tall, slender specimens of *Iriartea exorrhiza*, but rarely so high as tall forest trees.

The forest where we remained the 10th of May contained many tall trees, chiefly figs and mulatto tree, the white flowers of a large Tiliacea, 3-sepalous, 6-petalous small, strewed the ground.

A good many palms mixed—*Iriartea exorrhiza* and *I. ventricosa*, *Wettinia Maynensis*—an Astrocaryum, near *A. vulgare*—a Bactris, (*Phytelephas*) *Yarina*, very abundant and sometimes, along with the *Iriartea ventricosa*, covering large flats, almost without mixture—stems sometimes 10 feet high deeply scarred but petiole-bases not persistent. *Discanthus odoratus* and other small Cyclanthaceae. Shrubs were few, and none in flower save an Acanthacea.

Patches of a flabellate Selaginella, an Acanthacea with sulphur flowers, scented like the primrose, a Commelynacea (*Dithyrocarpus*) near a Yurimaguas species, but larger.

In moist places, on leaves of ferns and other plants, a good store of the curious *Hookeria Patrisiae* in fruit, which is rare. Another pretty Hookeria was frequent on branches and in good fruit. I have seen it all along the Bombonasa. My Distianthus occurred very sparingly, as it always does. The ubiquitous vesiculose Hypnum was abundant. Save these there was nothing noticeable.

On the morning of the 12th, though the riparial vegetation was unchanged in general constituents, some new things were observed, a Humiriacea with white flowers allied to a Casiquiare species. Some shrubby small-flowered Rubiaceae in the forest, resembling Psychotriae, but not referrable to that genus. A curious fern exactly resembling a Lindsaea in aspect, and form of pinnae, but with the fructification of a Diplazium, fronds $1\frac{1}{2}$–4 feet.

Wettinia Maynensis (*Palmae*) is now very frequent and grows occasionally close by the margin, along with the Iriarteas, from which it is distinguished at sight by the pinnae being equidistant and all spreading out from the rachis horizontally, but pendulous (from their weight) towards the apex, so that the entire frond has a widely channeled form. In the Iriarteas the laciniae of the pinnae are in fascicles, the uppermost of each fascicle standing out above the rachis, the lowest pendulous, the rest at intermediate angles, ♀ spadix very constantly 5-branched.

May 13. This day saw an Orchid in a tree for the first time since entering the Pastasa. It was an Epidendrum with corymbs of vermilion flowers, very like that from the falls of Aripecuru.

Chimbillas disappeared just within the mouth of the Bombonasa, but the Pithecolobium is more frequent than on the Pastasa. Two broad-leaved Ingas seen on the Marañon and Pastasa are still not unfrequent. Bamboos, Gynerium, and Cecropias still grow in suitable places, as do also the Mulatto-tree and Ama-Sisa (*Erythrina amasisa*).

The Chapaja and Biroti-wasi palms have given place to *Wettinia Maynenis*, *Iriartea ventricosa* and *Oenocarpus Bataua*. The Rio Negro Euterpe is not unfrequent.

In pursuing the Pinche a large animal fell from a projecting branch a little ahead of us with a loud crash and then darted off like an arrow. It was a tiger [jaguar], doubtless awaiting till some prey should pass beneath. I did not even see it, but the Indian who was a few steps in advance did, and the marks of its broad feet were plain enough on the ground. We followed its track a short distance, but it had made clear off.

Above Capirona-tipishco in places where steep cliffs rise from the water's edge the vegetation has great similarity to that of the Pongo of the Huallaga. There is the same peculiarity of fine-leaved species of several families, and some of the species seem identical. Along the high-water line, especially where there is any approach to a ledge, there is a dense growth of *Calliandra Magdalenae* (*Leguminosae*), the stems about 15 feet high and much branched, but generally stretching horizontally from the face of the rock. It grows also on the stony points of islands, where it is much inclined by the force of floods, and in this respect quite resembles the Calliandra of the Huallaga; but the branches are much more flexible, and not long and wand-like, as in the latter.

Below the Calliandra on an inundated face of rock is a broad bank of a small, almost stemless, Carludovica (*Cyclanthaceae*), the pendulous shining-green fronds bipartite, the segments so narrow, and at so small an angle to each other, that until closely looked at one would take the plant for a grass. It is very like the Yacu-Sisa of Tarapoto. Underneath the Carludovica grow ferns and mosses down to the water's edge, with here and there a scattered shrub. Of these shrubs the chief are a small Myrsinea and a very narrow-leaved Myrcia (*Myrtaceae*), both apparently identical with species at the Pongo of the Huallaga. There is also a narrow-leaved Rubiacea, resembling a Huallaga species, but different. I

do not, however, yet remark any representatives of the fine-leaved Lauracea and Melastomacea, so conspicuous on the Huallaga.

There are not wanting abundance of small-flowered, perennial Acanthaceae, of two or three species, and the moss, which everywhere hangs in long tufts from inundated branches, is (as on the Huallaga) *Neckera disticha.*

Carludovica palmata is not unfrequent on cliffs, but more frequent is a species resembling it in the flabellate, vandyke-edged fronds, which, are, however, smaller and bi- (not 4-) partite.

Two small suffruticose Lythraceae are frequent, one with white, the other with purple flowers. [Both are *Cuphea Bombonasae.*] On muddy margins is a third (twining) species of the same genus, as well as some Gesnereae. The most abundant ferns are a small form of Nephrodium and a Meniscium, both found at Tarapoto.

The mosses include a Bryum in large lax dingy patches.

Vegetation of the forests of Bombonasa, near Puca-yacu.—Numerous ridges rise to 200 feet or 240 feet above the rivers, and the valleys are deep, with often steep sides, clayey or gravelly, but with no beds of hard rock. There is some similarity to the ground about and above the mouth of the Rio Negro on the left bank, though the hills are there of less elevation.

Among trees there must be many new species, but none are now in flower. A Lecythidea, with leaves like a Lecythis, has round fruits (like apples) growing on the naked trunk, as in Couroupita. One tree is almost certainly a Henriquezia ; the leaves grow in fours, and are much longer than those of *H. verticillata.* A tall Eriodendron, with the habit of *E. Samauma*, has no buttresses at the base of the trunk.

Of brushwood nearly everything seems of known genera, but many of the species are new. Solanums are in endless variety, as through the Pastasa, but individuals of each species are few flowered and grow widely apart, as is usual with forest species of this genus, with a few exceptions.

The Palms are *Iriartea exorrhiza* and *I. ventricosa*, the Biroti-wasi, and several small Geonomas and Bactrides.

The most striking feature of the vegetation of the gravelly slopes, as compared with those of the rivers Negro, Uaupes, and Huallaga, is the abundance of small gay-flowered Gesnereae, Acanthaceae, and Lobeliaceae ; but there is some similarity to the valleys of Tavalosos and Mount Campana, near Tarapoto, and an Acanthacea, with numerous lilac flowers, is evidently of the same genus as a Campana plant, though a distinct species.

There are two or three Begoniaceae, one climbing species, remarkable in having all parts of the inflorescence of a bright vermilion.

The district cannot be called mossy, though trunks and branches of trees are in some places enveloped with *Plagiochila hypnoides* and two other common species, often accompanied by a Pilotrichum or Meteorium ; but the richest genus is Hookeria, of which there are at least ten distinct species, growing chiefly in shady gullies on the branches of shrubs and on stones in the rivulets. *Bryopteris filicata* is very frequent, and *B. diffusa* hangs here and there.

The twining Selaginella is very frequent, not only near the villages, but far away in the forest, ascending trees to 20 feet, and sometimes forming an impenetrate thicket.

A handsome Polypod, sometimes 8 feet high, is frequent. About the village there are beds of a Davallia, 3–7 feet high, remarkable for the triangular outline of the fronds; and a Pteris, at first glance resembling *Pteris caudata*, but prickly. On branchlets of trees by rivulets is a minute Asplenium, allied to *A. Ruta-muraria*, not observed before.

From Puca-yacu to Canelos many Pastasa trees still occur, e.g. Ama-Sisa, Homaliacea, and the palms *Wettinia maynensis* and Biroti-wasi.

Hardly any tree is in flower, scarcely even an Inga, so that I cannot say what new trees begin to appear by the margin. There is one tree of 40–50 feet with pinnate leaves and very large leaflets, hoary beneath, which looks very like a Swartzia.

The cliffs are sometimes very mossy, and in a hasty look at one I detected a new Tortula, allied to *T. fallax*, but with more setaceous leaves. On inundated branches, along with *Neckera disticha*, grows a curious Neckeroid branched Fissidens, six or more inches long. The smooth-leaved *Lamas Condaminea* grows here and there on cliffs.

Orchids begin to be less unfrequent. A large-flowered Sobralia, allied to that of Campana, grows on wet cliffs, and on an inundated stump I saw the Tarapoto Cypripedium.

XXVIII.—WITCHES' BROOM OF CACAO.

(*Colletotrichum luxificum*, Van Hall & Drost.)

During the past twelve years a serious disease affecting the Cacao tree (*Theobroma Cacao*, Gaertn.), has been prevalent in Surinam. In 1906 the same disease was observed in Cacao plantations in Demerara by Mr. A. W. Bartlett, Superintendent of the Botanic Garden, Georgetown. The disease is indicated by the presence of hypertrophied shoots, which assume the well-known characters of a witches' broom. Such branches present a swollen appearance and often have strongly marked longitudinal furrows at the basal end. The leaves remain small and are soft and pliable. Lateral branches are produced in abundance, although the hypertrophied branch remains short. The general direction of growth of the branches is vertical, and the whole structure is ephemeral, soon dying.

In 1900 Professor Ritzema Bos investigated the disease, which he concluded to be caused by a fungus which he named *Exoascus Theobromae*. A specimen sent to Kew by Mr. J. H. Hart was examined, but only sterile mycelium penetrating all the tissues could be found, and this certainly did not belong to an *Exoascus*.

Quite recently Dr. C. J. J. Van Hall, Inspector of Agriculture in Dutch Guiana, and Mr. A. W. Drost, have paid much attention to the subject, and have proved that the disease is due to a parasitic fungus they have named *Colletotrichum luxificum*. No

species of *Exoascus* was observed. The inflorescence is also attacked, resulting in the production of a dense agglomeration of flowers, due to many of the pedicels giving off branches. Some of these branches assume a vegetative character, and form small witches' brooms. The flowers in such clusters are often hypertrophied and abortive.

It has been observed that in those plantations where witches' brooms were present much of the fruit was damaged. This injury, however, was generally considered by the planter to be identical with the "black pod" disease of cacao pods in the West Indies, caused by *Phytophthora omnivora*. A careful investigation of the subject by Hall and Drost showed that this was not the case, but that in reality the pod disease was caused by the same fungus that led to the production of the witches' brooms. The induration of the fruit presents the following characteristics: the hardening of the tissues of the infected area, which often forms a swelling in young or half-grown pods; the swollen or gouty appearance of the fruit stalks, and the blackening of the diseased patch. Such diseased pods rarely mature, but fall before they are half grown.

When witches' brooms are present in quantity the trees are often killed outright, and in those cases where the disease is less severe the yield of fruit is much less than under normal conditions. In addition to the formation of the witches' brooms the fruits themselves can be infected directly, and a large quantity is destroyed in this manner.

It has been ascertained that the disease spreads very slowly; a single badly attacked tree may be present for a long time in a plantation before the neighbouring trees show signs of the disease, and then its progress is at a slow rate. Nevertheless, the fact must be kept in view, that unless checked the disease does spread, and has been the cause of serious losses to planters on the mainland, to which it is, up to the present, confined.

So far as has been observed all varieties of Cacao trees are equally susceptible to the disease. Drainage appears to exercise no appreciable influence.

Owing to climatic conditions and the fact that the plants produce new shoots throughout the year, spraying with Bordeaux mixture is impracticable. As the disease spreads at a slow rate, the only certain remedy is the removal of all witches' brooms and diseased fruit. Wounds should at once be covered with tar. Diseased fallen fruit should be collected and burned.

Hall and Drost; Recueil des Trav. Bot. Néerl., Soc. Bot. Néerl., 4, p. 243, 17 pl. (1908).

Ritzema Bos: Tijdschr. over Plantenziekten, 6, p. 65 (1900).

XXIX.—MISCELLANEOUS NOTES.

Mr. A. W. Benton, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, at the request of the Secretary of State for the Colonies, on the recommendation of Kew, Gardener for Government House, in the Falkland Islands.

Mr. J. Hutchinson, whose appointment as Assistant for India was recorded in *Kew. Bull.*, 1908, p. 421, has been transferred to the post of Assistant for Tropical Africa on the staff of the Royal Botanic Gardens.

Mr. W. G. Craib, M.A., formerly officiating Curator of the Herbarium attached to the Royal Botanic Gardens, Calcutta, has been appointed Assistant for India on the staff of the Royal Botanic Gardens by the Secretary of State for India in Council.

João Barbosa Rodrigues.—A Reuter telegram announced recently the death of Professor João Barbosa Rodrigues, the well-known Brazilian botanist and Director of the Botanic Garden at Lagoa Rodrigo de Freitas, near Rio de Janeiro.

Barbosa Rodrigues, the son of a merchant, was born in the State of Minas Geraes on June 22, 1842. He intended to qualify for the medical career, but, after the death of his father, adverse circumstances obliged him to abandon his studies and accept a post as secretary, and later on as drawing master at the Imperial Pedro II. College. Here he was introduced into the study of botany by Professor F. Freire Allemão. Botanical excursions in the neighbourhood of Rio de Janeiro and in his native state fitted him for the long series of expeditions which he undertook between 1869 and 1897, mainly in the Amazon basin, but later on also in the Southern States and in Uruguay and Paraguay. In 1883 he founded a botanical and ethnographical museum at Manáos, on the Amazon, which he superintended himself until 1889, when he was appointed Director of the Botanic Garden near Rio de Janeiro, a post which he held until his death. On his travels he does not seem to have availed himself much of the splendid opportunities for collecting. He rather studied plants from life, and, being a fair draughtsman, filled his portfolios with sketches and analyses, mainly of palms and orchids, his favourite families. His first descriptions and illustrations of members of these two families date back as far as 1875 and 1877 respectively. They were the first contributions to the great task he had set himself from the beginning of his botanical career, and to which he adhered with rare perseverance—namely, the elaboration of monographs of the *Orchidaceae* and *Palmae* of Brazil. He was not allowed to carry the monograph of the *Orchidaceae* to a conclusion. It was planned on a sumptuous scale, which, in the end, he found beyond his means. It was intended as an Iconographia, with coloured illustrations in natural size and analyses, of all the species found in Brazil. Up to 1891 he published preliminary diagnoses of not less than 573 new species, 25 new genera, and 1 new tribe, whilst his collection of drawings had by then run up to about 900 plates. In the almost complete absence of specimens, and considering the shortness of the diagnoses, there was great danger that most of his new species and genera would remain obscure; but, seeing that he himself should not be able to reap the full fruits of his almost lifelong work, he generously handed the bulk of his drawings over to his more fortunate rival,

Professor A. Cogniaux, who had been entrusted with the elaboration of the *Orchidaceae* for Martius' *Flora Brasiliensis*. They were very largely used for the illustration of that work, and Barbosa Rodrigues' share in this field was thus, after all, recognised and secured. Through the good offices of Professor Cogniaux, Lady Thiselton-Dyer was enabled to copy, for the Kew collection, a set of about 550 of Barbosa Rodrigues' coloured original drawings, one of the finest contributions of this kind within a single order.

Barbosa Rodrigues was more fortunate with his monograph of the Brazilian palms. The first impulse to it was given when, in 1872, he was commissioned by his Government to continue Martius' studies of the palms of Brazil. He took the task up with his usual enthusiasm, working almost entirely from the standpoint of the field botanist, studying, analysing, and drawing on the spot. For a long time it seemed as if his work would not be recognised and would share the fate of his Iconographia of the *Orchidaceae*, but at length, in 1902, he had the great satisfaction of a special vote being passed by the Brazilian Congress for the publication of his *Sertum Palmarum Brasilianarum*. He himself came to Europe and superintended the printing at Brussels. It consists of two large folio volumes of 140 and 110 pages of text and 91 and 83 coloured plates, and contains descriptions of 42 genera and 382 species, of which no less than 166 are credited to him as author. The originals for the plates were all drawn by himself, often with a delicacy to which the prints hardly do justice. He was a fertile writer, and his publications deal not only with botany but with many subjects pertaining to archaeology, palaeontology, ethnography, and the Indian languages.

O. S.

Caraipa africana.—In 1868, Oliver described under this name a doubtful specimen collected by Baikie in the Niger region (Fl. Trop. Afr., vol i., p. 172). *Caraipa* is a genus of *Ternstroemiaceae*, and was previously known only from Tropical America, but this presented no phytogeographical difficulty, as it is well known that there is a strong common element in the floras of West Africa and Tropical America (*see* Engler, Fl. Verw. Trop. Afr. u. Amer.). Subsequently, however, as appears from a note on the herbarium sheet, Oliver referred *C. africana* to the family *Dipterocarpaceae*, but without suggesting a genus ; and it has now been identified as *Monotes caloneurus*, Gilg.

Monotes was described in 1868 by A. De Candolle, who included it in the *Dipterocarpaceae*, while recognising it as an aberrant type. It was afterwards referred to the *Tiliaceae* by Heim and Pierre, but was finally restored to the *Dipterocarpaceae* by Gilg (Engl. Jahrb., vol. xxviii., p. 134).

The identification of *Caraipa africana* with *Monotes caloneurus* rests on comparison with Schweinfurth's No. 4272, from Djur Awet, quoted without number by Gilg. Schweinfurth's No. 2678 and Baum's No. 925, which Gilg also refers to *M. caloneurus*, seem rather different.

T. A. S.

Botanical Magazine for April.—The plants figured and described are : *Impatiens Hawkeri*, Bull ; *Microloma tenuifolium*, K. Schum. ; *Arbutus Menziesii*, Pursh ; *Strophanthus Preussii*, Engl. and Pax ; and *Anthurium trinerve*, Miq. *Impatiens Hawkeri*, a native of Eastern New Guinea, was first brought into commerce in 1886, having been introduced by the late Mr. W. Bull of Chelsea. This and the closely allied *I. Herzogii*, K. Schum., are the only species at present known from the island, though it is estimated that in Asia and its islands there are altogether about 500 species. The two named are the most easterly representatives of the genus in Asia. *Microloma* is a genus of Asclepiadaceae which comprises ten species, all of which are confined to South Africa. *M. tenuifolium*, known as the Coral Climber of South Africa, has very slender twining stems, linear leaves, and lax umbels of small crimson wax-like flowers. The specimen figured was grown in Mr. Gumbleton's garden at Belgrove, near Queenstown, Ireland. *Arbutus Menziesii* was introduced into this country as long ago as 1825, when David Douglas sent seeds from Western North America to the Horticultural Society of London. It sometimes develops into a large tree, reaching in California upwards of 100 feet in height. The finest Kew specimen is about 20 feet high, with a short trunk four feet eight inches in girth, and a wide-spreading head. The *Strophanthus* is a West African species, which is illustrated from a specimen raised at Kew from seeds communicated by Mr. W. H. Johnson in 1902, when he was Curator of the Botanic Station at Aburi, Gold Coast. The lobes of the yellowish-white or pale orange corolla taper at the apex into filiform crimson appendages, which are as much as a foot in length, and give to the plant a most extraordinary appearance. *Anthurium trinerve* is noteworthy from a gardener's point of view on account of its free production of spikes of pretty lilac fruits, which are certainly attractive. It is a native of Brazil and Guiana, and has for many years been in cultivation at Kew.

Botanical Magazine for May.—*Dendrobium Bronckartii*, Wildem., is a recent introduction from the Mountains of Annam, Indo-China, and the plant figured was purchased in 1906 from Mr. Verdonck of Ghent. It resembles the well-known *D. thyrsiflorum*., Reichb. f., but it is larger in growth, the racemes are larger and laxer, and the flowers are light rose-coloured, with a large orange blotch on the disk of the lip. *Larix occidentalis*, Nutt., of Western North America, has been figured from a specimen growing at Kew which was received in 1881, as a seedling, from the Arnold Arboretum. It has now reached a height of 36 feet, and the trunk near the ground measures 26 inches in girth. Though it has proved too tender for successful cultivation at Weenen, in North-West Hanover, it is quite hardy at Kew, and hopes are entertained that it will become a valuable forest-tree in this country, as a substitute for the European Larch, which has suffered considerably in many districts from the attacks of *Peziza Willkommii*. *Mussaenda Treutleri*, Stapf, is an old garden plant, but appears under the erroneous

name of *M. macrophylla*, Wall., from which it is distinguished by numerous characters, amongst them being the more scattered, rougher hairs, larger leaves, broader stipules and larger corollas. It is also known as *M. frondosa* var. *grandifolia*, Hook. f. A native of Tropical Himalaya and Khasia, it is grown at Kew as a stove plant, and owes its attractiveness chiefly to the enlarged white calyx-segments. *Deutzia setchuenensis*, Franch., is one of the several Chinese species which have lately appeared in European gardens, all of them being ornamental free-flowering more or less hardy shrubs. The plant figured is allied to *D. staminea*, R.Br., but has larger acuminate leaves, longer flowering branchlets, and a corymbiform inflorescence. It was presented to Kew in 1897 by Mr. M. L. de Vilmorin. The Himalayan *Pyrus Pashia*, Ham., var. *Kumaoni*, Stapf, is the same as *P. Kumaoni*, Dcne. Typical *P. Pashia* has densely cottony leaves and calyces ; the variety here named is glabrous or glabrescent, and its calyx-lobes are usually more broadly triangular and less produced at the apex. It has long been in cultivation at Kew.

Epacris dubia, *Lindl.*—In March, 1909, a dwarf *Epacris* flowered at Kew which it was impossible to match with any specimen in the Herbarium collection. On referring to published figures it has proved to be identical with the plant figured in the *Botanical Magazine*, at t. 3257, as *E. heteronema*. The plant thus figured was subsequently referred doubtfully to *E. heteronema* as a distinct variety, *subreflexa*, DC., in *DC. Prod.*, vol. vii. 2, p. 762, and the suggestion was there made that it might be a distinct species. In the *Flora Australiensis*, vol. v., p. 239, *E. heteronema*, var. ? *subreflexa*, DC., is not taken up, though Mr. Bentham refers to the figure on which De Candolle's variety was based ; this figure is cited under *E. heteronema*, var. ? *planifolia*, Benth., with the remark that the drawing is " incorrect as to the corolla."

Now that it has been possible to examine again an example of the plant originally figured by Sir William Hooker it is found that the drawing published by him is perfectly accurate, and it further transpires that this plant is not the same as the plant represented by the original specimens of *E. heteronema*, var. ? *planifolia*, Benth. It is altogether distinct from typical *E. heteronema*, Labill., in habit, foliage and flowers, and after careful comparison it appears almost certain that this plant, figured in the *Botanical Magazine*, at t. 3257, is a form of *E. dubia*, Lindl., as figured in the *Botanical Register* for 1846, at t. 38. The flowers of the two seem identical, but the leaves of the *Botanical Magazine* plant are reflexed and the stems are more slender than in the *E. dubia*. It is on this account proposed that the plant figured as *E. heteronema*, Hook. Bot. Mag. t. 3257, not of Labill., be treated as a variety of *E. dubia*, Lindl. (*E. dubia*, var. *subreflexa*, N. E. Br.).

Pouteria suavis, *Hemsl.*—Under the title of " A new fruit from Uruguay " an account of this plant was given in the *Bulletin*, 1906, p. 365, and it was mentioned that steps had been taken to establish

the tree in Mr. Garnier's garden at Bordighera. Through the kindness of Madame Vve. Charles Garnier, of the Villa Amica, Bordighera, we have been placed in correspondence with Sig. Giovanni Lanteri, President of the Società d'Orticultura, E. M. S. della Liguria in San Remo, who has had the experiment of the acclimatisation of *Pouteria suavis* under his charge. In a letter to the Director of March 30, 1909, he informs us that he has grown the *Pouteria* in the gardens of the Villa Garnier since 1906. The seeds, which were received direct from Paysandu (Uruguay) germinated readily, and at the present time 15 plants are flourishing in the gardens; these have resisted two degrees of frost in the open. He also mentions that he has acclimatised *Lucuma neriifolia*, Hook. and Arn. (*Sapotaceae*), which he is in hopes may serve as a "stock" for the *Pouteria*, as it is more hardy and vigorous.

A large consignment of the fruits of *Pouteria* was received at Kew from Sr. E. Frosio, Horticulturist, Salto, Uruguay, some of which were packed in wax and some in moist sawdust. The seeds packed in wax arrived apparently in excellent condition, but the seeds failed to germinate. Of those packed in sawdust a large percentage has germinated, and the plants are now some ten inches high.

Process of cleaning Rice in Lower Bengal.—The following note on this subject has been supplied by Captain Gage, Superintendent of the Royal Botanic Garden, Calcutta :—

"Paddy (unhusked rice) is soaked in cold water for 24 to 36 hours. It is then removed in a large earthen pot 'handy' and boiled with a little water—about half a seer (seer = 2 lbs.) in a 'handy' containing about ten seers of paddy—until some of the grains burst. The grains are then dried in the sun over a mat. The drying process is thought to be completed when the grains inside the husks become hard. The husks are then removed by a wooden machine called 'dheky'."

The details of the subsequent treatment are well known, but the procedure above described is rarely alluded to in detail in works of reference.

Flora of Bombay.—The final part of the second volume of Dr. Cooke's Flora of Bombay completes the first to be commenced of the series of local Floras designed to supply for its different provinces the place filled as regards the Indian Empire as a whole by the Flora of British India. For different portions of the vast area dealt with by Sir J. D. Hooker and his colleagues separate or partial Floras have from time to time been published. The series now begun has been planned on definite lines to revise or supplement the larger work for local areas. The information there placed for the whole of India and Ceylon in a systematic form at the disposal of all interested in the vegetable wealth of those regions is thus being completed and brought up to date.

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* The Flora of the Presidency of Bombay, by Theodore Cooke, C.I.E., M.A.I., LL.D., F.L.S., F.G.S., &c.

The arrangement followed in these local Floras is that of the *Genera Plantarum* of Bentham and Hooker.

The volume before us gives evidence of reliable and thorough work both in the field and with the microscope.

In spite of a warning note by Roxburgh, who was the first to examine the minute structure in *Olea dioica*, it has been authoritatively stated that the female blossoms were devoid of a corolla, but Dr. Cooke shews (p. 118) that in the functionally female flower stamens and corolla are regularly developed ; the corolla falls off early, taking with it sometimes all the stamens, sometimes two out of three ; and he adds the interesting and significant fact that in a few cases a proportion of the stamens spring, not from the floral envelope but from the ovary itself. Under *Nothosaerua* again (pp. 494-495) there is a lucid clearing up of the facts, and, in this instance, of the bibliography as well, which, in the case of Indian plants, is too frequently a formidable item. Characteristic examples of close observation, frequently involving careful and laborious dissections, are to be found in the treatment of such genera as *Sarcostemma* (pp. 158-159), *Ceropegia* (pp. 173, *et seq.*), *Lindenbergia* (pp. 306-307), and of the whole family of *Gramineae*. In matters of nomenclature the same painstaking accuracy is conspicuous,—as under *Bassia* (p. 92), where " Illipe, Koenig " is, let us hope, finally consigned to the limbo of unhappy emendations ; also *Moniera* (p. 285), and *Ardisia solanacea*, Roxb. (pp. 86-87). The cases of the *Ardisia* and of *Diospyros Tupru* (see p. 99), also *Cordia* (pp. 198-202), illustrate a difficulty as regards these local Floras which it is perhaps easier to point out than to remedy, a difficulty which appears in the Flora of British India to begin with, in the later volumes more especially, through the incorporation with the text of critical discussions. It is hardly needful to point out the very obvious inconveniences that result when an author is driven to compress memoirs of this kind within printer's limits and to intersperse them among his descriptions ; but one especially regrettable effect is that those working under such conditions are compelled in practice, in some cases, to accept results embodied in some wider treatment of a family or genus with which they can hardly be themselves in real accordance. Thus, at p. 413, Dr. Cooke has placed a most interesting addition to the Flora of Bombay under " *Monechma*, Hochstetter " as set out by the late Mr. C. B. Clarke in the *Flora of Tropical Africa*, vol. v., p. 214 ; but the genus *Monechma*, as conceived by that authority, is not Hochstetter's genus, nor did Hochstetter, strictly speaking, separate his genus *Monechma* from *Justicia* on grounds recognised by any subsequent botanist ; it would seem almost as if he had assumed the plant brought from the Nile basin by Kotschy (No. 261 Kotschy) to have been a novelty, whereas, rightly or wrongly, it has been, by subsequent consent, identified with *Justicia debilis*, Linn. Further we have no means of knowing, without critical study of the material at Kew and elsewhere, to which of the half-dozen or so of Clarke's varieties (at least two of which are pretty certainly good species) of " *Monechma bracteatum*, Hochstetter," the Porbandar plant is to be attributed, although interesting questions of phytogeography are raised by this striking

illustration of the links that connect the coast and desert flora of Western India with parts of East Africa and the sub-tropical Nile Valley.

Where Dr. Cooke has allowed his own judgment to prevail, the results suggest that, at times, respect for justly esteemed authority has carried too much weight, as when, for instance, at p. 273, following the Flora of British India and other standard works, the seeds used by the roadside poisoners of India are attributed to *Datura fastuosa*, Linn., var. *alba*, C. B. Clarke, which is *D. alba*, Nees von Esenbeck. The plant of Nees is specifically distinct from *D. fastuosa*, and the name appears to have been given not with reference to the colour of the flower, but for other reasons; but in any case the seeds ordinarily, if not always, used by the professional "poisoners," are neither those of *D. alba* nor of *D. fastuosa*, but of *D. Metel*, Linn., a native of Central America, now widely diffused in the dry sub-tropics from Birma to North Africa, and extending to the northern shores of the Mediterranean. One or more species of *Datura* were used long ago in parts of what is now the Bombay Presidency, although not by thieves, for criminal purposes; but the art of the road poisoner, and most of the "Thugs" who practise it, are alike imported from North-Western India, where *Datura Metel*, to which the moister parts of India are unsuited, flourishes in the Punjab ranges, and the low outer Himalaya more especially. Similarly a tradition which finds place in the *Flora of British India* that many plants supposed to have been collected in Sind by Stocks or by Vicary were actually found west of the somewhat hazy frontiers of Beluchistan has been if anything too religiously followed, with the result that so typical an Indus Valley plant as *Arnebia Griffithii*, Boiss., is marked as a doubtful inhabitant of that Province. It is quite true that when Col. Perronet Thompson sent the seeds from which the type of the picture in the *Botanical Magazine* (t. 5266) was raised, his regiment had its headquarters at Sialkot, on the Kashmir border; but the "prophet's flower" does not grow within many scores of miles from that station, and in spite of the defective material in this country, its occurrence between the right bank of the Indus and the frontier hills of Northern Sind may be assumed with certainty.

Of the general accuracy of the nomenclature throughout this work it is needless here to multiply examples, but the wholesome rule hitherto followed in these local and Colonial Floras of using that specific name which is the oldest under the genus to which the plant is referred seems to have been varied in part of the work. Otherwise, it does not appear why at pages 572 and 573 "*Bridelia retusa*, Spreng." and "*B. stipularis*, Blume," should have supplanted *B. spinosa*, Willd. (assuming that this is identical with Sprengel's "retusa") and *B. scandens*, Willd.

Besides, if we are to set aside the arguments, on this vexed question, of Alph. De Candolle—which are at the same time oftener ignored than met, not to say answered—why not "*Briedelia retusa*, Linn."?, for the credit, or otherwise, of having devised that not very happy trivial name belongs to Linnaeus. The criticism under *B. Hamiltoniana*, on the identification in *Bengal*

Plants, p. 92, of *B. Hamiltoniana*, Wall., Cat. 7882, with *B. montana*, Willd., is so far justified that we have no means of learning without reference to Willdenow's Herbarium whether his *montana* is the same as Roxburgh's *montana*. Pending the appearance of Gohrmacher's work on this perplexing genus, it is chiefly guess-work matching any *Briedelia* with at least the older descriptions; but the very marked form from the Western Ghats which has been written up by some one in the Kew Herbarium as "*B. Hamiltoniana*," seems altogether different from Roxburgh's *montana*, and is not improbably an endemic and so far undescribed species. At p. 47 we cannot quite reconcile ourselves to "*Artemisia parviflora*, Buch.-Ham., ex Roxb. Hort. Beng." In the first place, although it may seem a very minor point, the correct citation of Francis Buchanan's labours might have been followed. That eminent worker's patronymic was Buchanan, which in later life he formally exchanged for the surname of Hamilton. He should, therefore, be quoted as "Buchanan, (afterwards Hamilton)" or for the latter period as "Hamilton (formerly Buchanan)"; it might possibly be just and convenient to refer to him for the purposes of natural history as Buchanan simply, but "Buchanan-Hamilton" or "Hamilton-Buchanan" he never was, and both these forms are objectionable. In this case the citation falls to the ground anyway, because, much as we may regret it, the *Hortus Bengalensis* does not properly fulfil the requirements of a systematic publication. It is more important, however, to observe that *A. parviflora*, Roxb. is identical with the *A. japonica* of Thunberg, in Fl. Jap. 310 (1874), which in any case had priority, so that Thunberg's name should be adopted for this widely diffused and, for an *Artemisia*, little varying species.

The author is to be heartily congratulated on the completion of this eminently useful account of the flora of a highly interesting and only partially explored part of the Empire. It is impossible within present limits to deal with the plants he has put before us, in a series of most excellent descriptions, as regards their distribution and their economic aspects; but as regards the latter, mention should be made of the carefully framed and very lucid keys that are prefixed to the more intricate or extensive genera, as well as those intended to assist students or beginners in finding the genus of a tree or herb under its family. The analysis of *Labiatae* (p. 438), that of *Euphorbiaceae* (p. 558), and, among genera, those under *Heliotropium* (p. 206), *Ficus* (p. 643), and *Eragrostis* (pp. 1021–1022), furnish examples. It remains only to add that this volume is concluded by a thoroughly clear and reliable index, and that the publisher deserves the thanks of all those who will use it for the format of the book and its freedom from typographical blemishes.

J. R. D.